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MODULE: Bachelors {Software Engineering}
SEMESTER: 4
SECTION: B
SUBJECT: Computer Communication & Networks
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Q.No.1 (a) The Open System Interconnect (OSI) model is a conceptual framework that organizes the functionalities of any type of communication in a layered structure. The Data Link Layer transforms bit streams into data streams, and handles the sequential transmission of these frames by regulating flows and handling errors. Or if the Higher layers use services provided by lower layers, and interface with them via Protocol Data Units (PDUs). What if the Foregoing several of the intermediate layers, we encounter in order from top to bottom the Presentation Layer, Transport Layer, Data Link Layer, and Physical Layer. If none of the above then there is a case that OSI model was introduced by the International Standards Organization (ISO). Argue the above case study and give your reasoning.

ANSWER:

The Open Systems Interconnection (OSI) Reference Model is a conceptual framework that describes functions of the networking or telecommunication system independently from the underlying technology infrastructure. It divides data communication into seven abstraction layers and standardizes protocols into appropriate groups of networking functionality to ensure interoperability within the communication system regardless of the technology type, vendor, and model.

The OSI model was originally developed to facilitate interoperability between vendors and to define clear standards for network communication. However, the older TCP/IP model remains the ubiquitous reference framework for Internet communications today. The older TCP/IP architecture model had already itself in real-world network environments. It served as a solid foundation for the Internet–including all of the security, privacy, and performance-related challenges. Continued research and development, investments, and industry-wide adoption of the OSI model could have made today's cyber world a different (and perhaps better) place, but the pragmatism of the TCP/IP model gave us the internet that prevails today.

The OSI model is widely criticized for an inherent implementation complexity that renders networking operations inefficient and slow. The academic approach to developing the OSI protocol suite relied on replacing existing protocols across all communication layers with better alternatives. This approach failed to gain traction in the industry; vendors had already invested significant resources in TCP/IP products and had to manage interoperability with the vast choices of protocols and specifications offered by the OSI model.

Q.No.1 (b) Argue the advantages and disadvantages of combining the session, presentation, and application layer in the OSI model into one single application layer in the Internet model**.**

ANSWER:

Advantages*:*

→ Single layer to study as all the Functorialities Provided at this layer.

→Higher Bandwidth as number of layers is reduced.

→ *Mostly it simplifies the conceptual problem of having to deal with those* things in the network stack itself:

→ The session and presentation layer use might pop up. But you should keep *in it up.*

Disadvantages*:*

→*make reasoning about the architecture of network systems less effective.*

→*There will be security issues as the Network Security and Application*

The Session Layer is the 5th layer in the OSI model that controls the dialogues (connections) between computers. It establishes, manages, and terminates the connections between the local and remote application. It provides for full-duplex, half-duplex, or simplex operation.

The Presentation Layer is the 6th layer in the OSI model and responsible for managing two networking characteristics: protocol and architecture. ... Upon arrival at the receiving computer, the presentation layer translates the data into an acceptable format usable by the application layer.

The Application Layer is the 7th layer in the OSI model and It consists of protocols that focus on process-to-process communication across an IP network and provides a firm communication interface and end-user services.

Q.No.2 (a) There are several network layer models proposed in the OSI model. Find all of them. Explain the differences between them.

ANSWER: **The seven-layers of OSI Model are given as:**

Layer7: Application Layer
Layer 6: Presentation Layer
Layer 5: Session Layer
Layer 4: Transport Layer
Layer 3: Network Layer
Layer 2: Data Link Layer
Layer 1: Physical Layer (Layer 1) Physical Layer,

the differences between OSI model:

The physical layer is the 1st layer of the OSI model and conveys the bit stream of electrical impulse, radio signals, light signals via the network at the mechanical or electrical levels. This layer also provides hardware means of sending and receiving the data on a way or a carrier thus includes the definition of cables, cards and physical aspects.
The Data Link Layer is the 2nd layer in the OSI model, at this layer the data packets are both encoded and decoded into bits. This layer is divided into two sub layers, first is Media Access Control (MAC) layer and Logical Link Control (LLC) layer.

The Network layer is the 3rd layer in the OSI model and this layer thus provides routing and switching technologies, creates logical paths called as virtual circuits for transmitting the data from one node to another node.

The Transport layer in the 4th layer in the OSI model and The Transport layer in the Open System Interconnection (OSI) model is responsible for end-to-end delivery over a network. Whereas the network layer is concerned with the end - to- end delivery of individual packets and it does not recognize any relationship between those packets.

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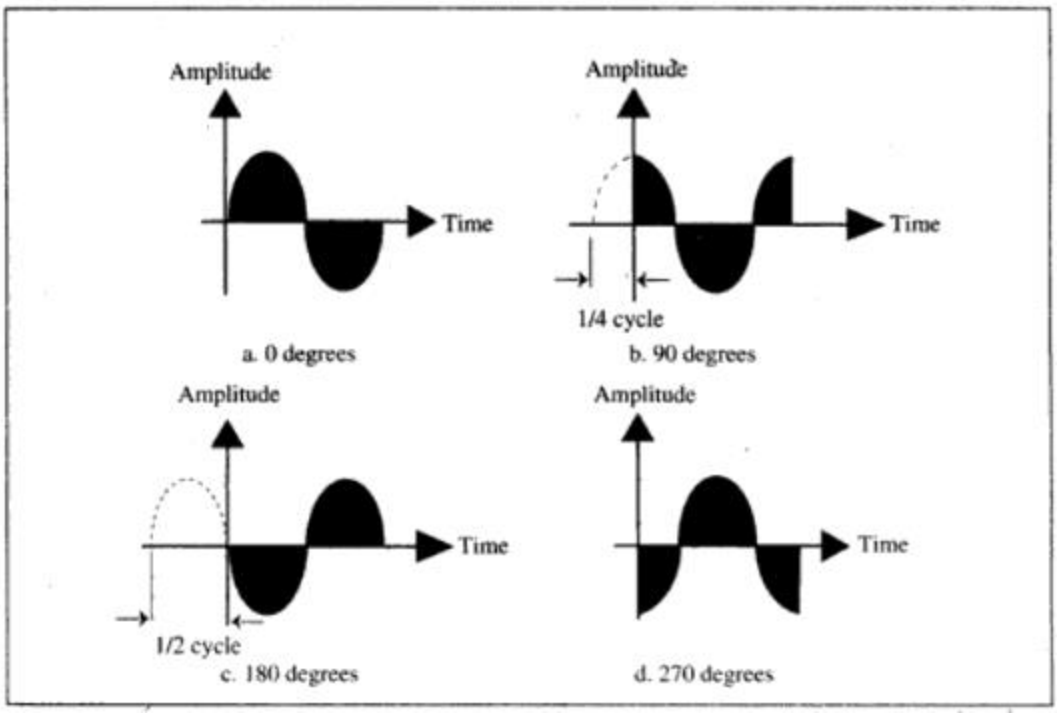
Q.No.2 (b) If a signal does not change at all, its frequency is zero. If a signal changes instantaneously, its frequency is infinite. Three components of a sine wave are amplitude, frequency and phase of a signal. The change in a signal shows the relation between signal's amplitude w.r.t to time whereas the phase is not shown. Explain your answer why we cannot explicitly show phase in a time-phase plot?

ANSWER:

Phase The term phase describes the position of the waveform relative to time zero. If we think of the wave as something that can be shifted backward or forward along the time axis, phase describes the amount of that shift. It indicates the status of the first cycle.

Phase describes the position of the waveform relative to time zero.

Phase describes the position of the waveform relative to time zero.
Phase is measured in degrees or radians (360 degrees is 21 radians). A phase shift of 360 degrees corresponds to a shift of a complete period; a phase shift of 180 degrees corresponds to a shift of half a period; and a phase shift of 90 degrees corresponds to a shift of a quarter of a period.



Q.No.3 (a) Four connections (10 Kbps, 100 Kbps, 1 Mbps and 10 Mbps) are multiplexed together. A unit is 1 byte or 8 bits. Find (a) the duration of 1 bit before multiplexing (b) the transmission rate of the link (c) the duration of a time slot and (d) the duration of a frame.

ANSWER:

a) the duration of 1 bit before multiplexing:

the duration of 1 bit as for 10 Kbps as follow:

$$\frac{\text{unit bit}}{\text{individual connection}} = \text{multiplexing}$$

So:

$$= \frac{1}{10\ \text{Kbps}}$$

$$= \frac{1}{10{,}000\ \text{bps}} = \boxed{0.0001\text{s}}$$

(or)

$$\boxed{1\ \text{ms}}$$ Ans

th duration of 1 bit for connection 100 Kbps as:

$$= \frac{1\ \text{bit}}{100\ \text{Kbps}}$$

$$= \frac{1\ \text{bit}}{100{,}000\ \text{bps}} = \boxed{0.00001\ \text{s}}$$ Ans.

the duration of 1 bit for connection 1 Mbps as:

$$= \frac{1 \text{ bit}}{1 \text{ Mbps}}$$

$$= \frac{1}{1 \times 10^6 \text{ bps}}$$

$$= \frac{1}{10^6 \text{ bps}} = 10^{-6} \text{ s} = \boxed{1 \text{ us}}$$

the duration of 1 bit for connection 10 mbps as:

$$\frac{1 \text{ bit}}{10 \text{ mbps}} = \frac{1}{10 \times 10^6} \text{ bps}$$

$$= 1 \times 10^{-7} \text{ s}$$

$$= \boxed{10 \times 0.5} \text{ Ans}$$

b) The transmission rate of link as:
The rate of the link is 4-times
The rate of a connection or 4 kbps.

c) the duration of a time slot as:

The duration of each time slot is one fourth of the duration of each bit before multiplexing, or 1/4ms or 250 u.s Note that we can also calculate this from the data rate of the link
4 kbps. The bit duration is the inverse of the data rate.
or 1/4kbps or 255 u.s.

d) The duration of a frame:
The duration of a frame is always the same as the duration of a unit before multiplexing. or 1ms . we can also calculate this in another way. Each frame in this case has four (4) time 80 slots, so the duration of a frame is 4-times 250us or 1ms.

Q.No.3 (b) We need a three-stage space-division switch with total inputs of 10,000. We use 1000 crossbars at the first and third stages and 16 crossbars at the middle stage.

a. Draw the configuration diagram.

b. Calculate the total number of cross-points.

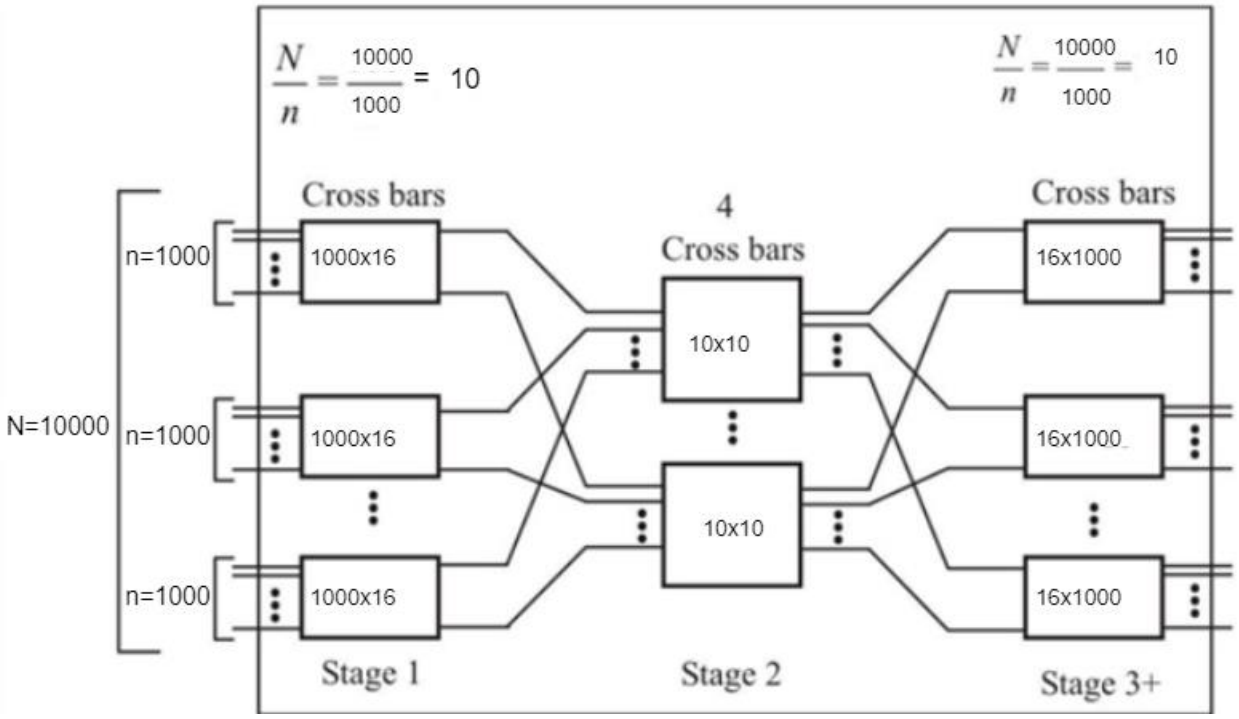
c. Find the possible number of simultaneous connections.

d. Find the possible number of simultaneous connections if we use one single crossbar (1000 x 1000).

e. Find the blocking factor and the ratio of the number of connections in c and in d.

ANSWER:
a)
Given data:
N=10000
n=1000
k=16

Draw the configuration diagram.



b) Total number of cross points= 1000(1000x16) +16(1000x1000) +1000(16x10000) =48000000.

c) Only four simultaneous connections are possible for each crossbar at the first stage. This means that the total number of simultaneous connections is 16x1000=16000

d) If we use one single crossbar (1000x1000), all the input lines can have a connection at the same time which means 1000 simultaneous connections.

e) the blocking factors 16000/1000 or 16000 percent.